Photometry from Herschel maps

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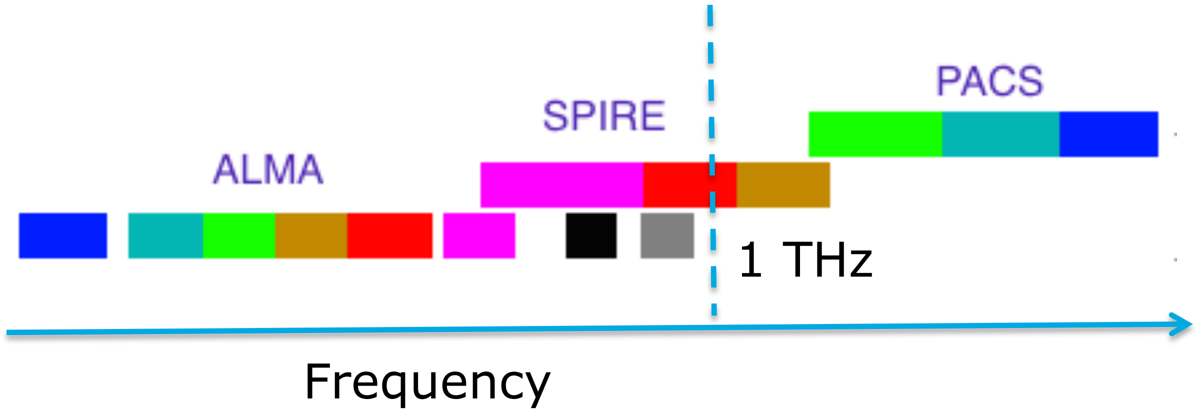
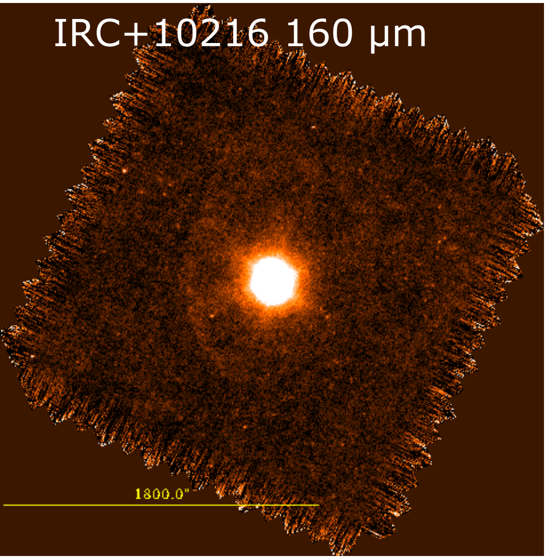
Herschel and ALMA: PACS

1. Two broad-band photometers with *Herschel*:
    a. PACS: 70 | 100, 160 μm
    b. SPIRE: 250, 350, 500 μm

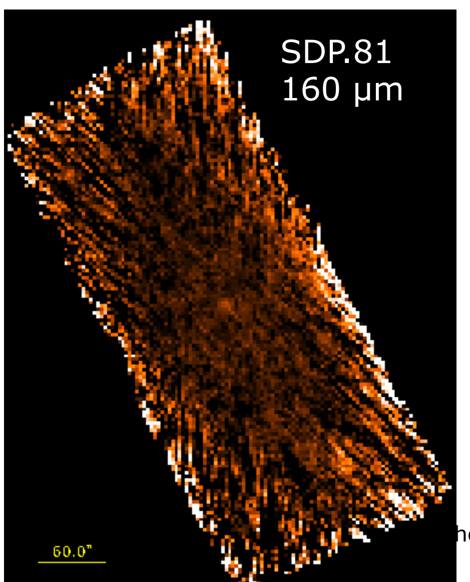


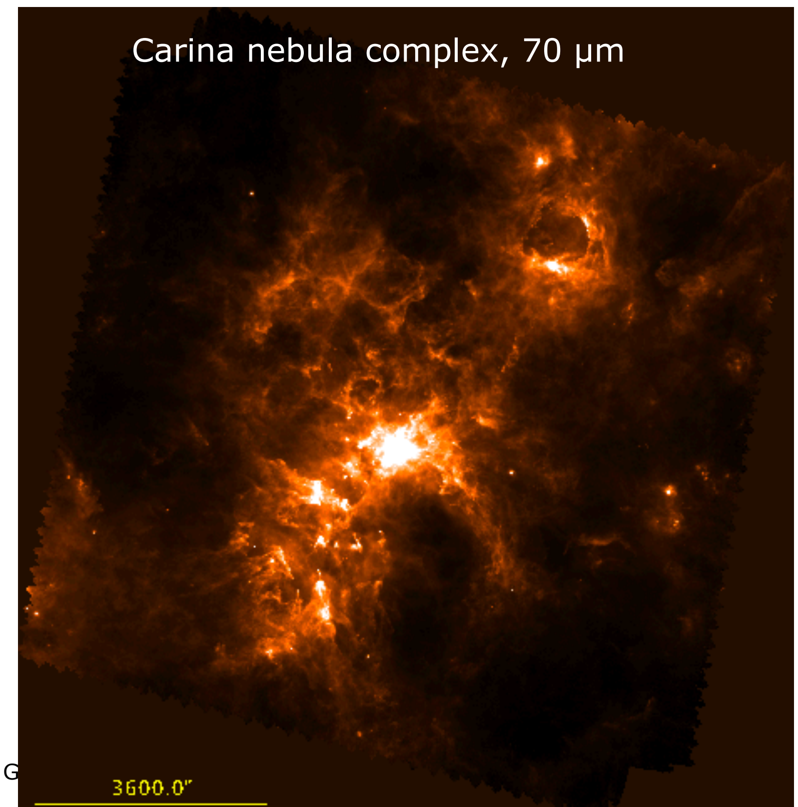
Bands are real in LOG spacing

PACS maps

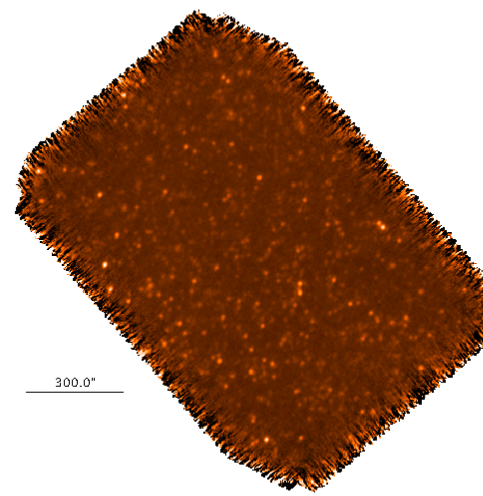


1. Scanamorphous maps (Jscanam), HPF, MADMAP…
2. Unimap is available with HIPE 13
3. Which one to use for photometry?



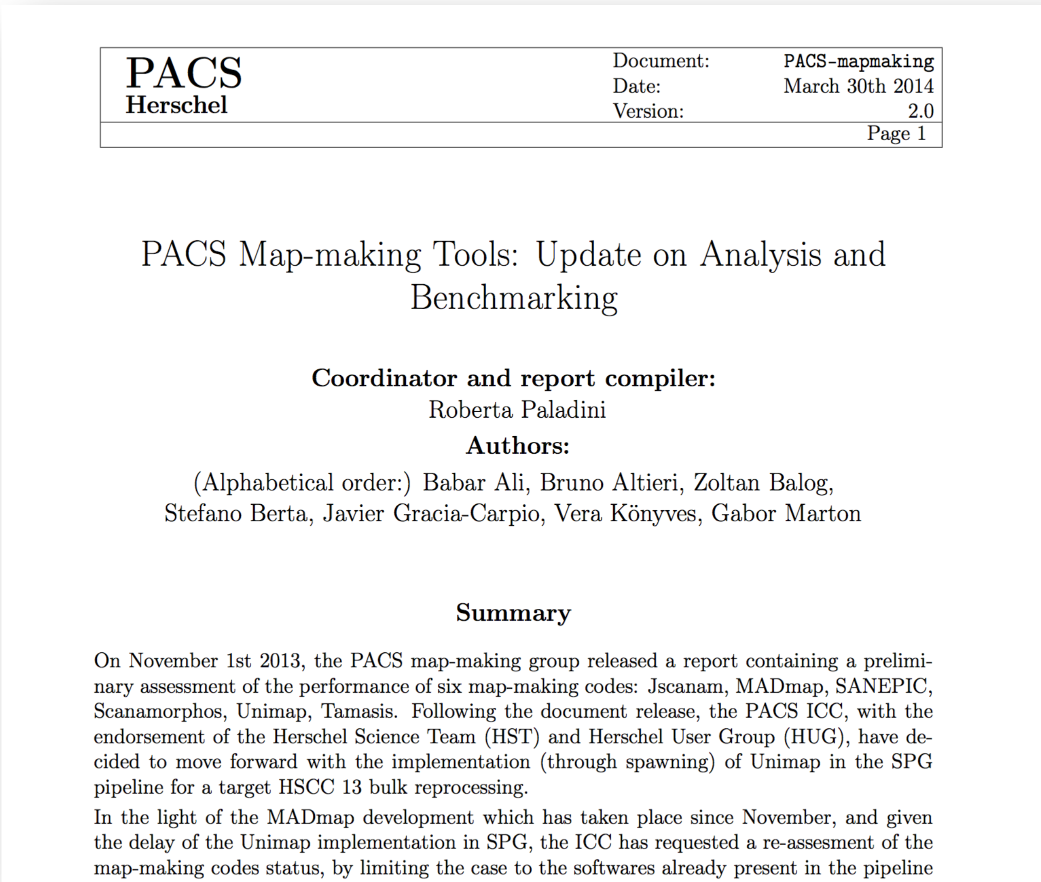


Nominal pixel sizes:
1.6″,3.2″ blue,red



GOODS-S at 160μm
Mosaic of 50 maps

PACS maps, further information



PACS
Herschel

Document:	PACS-mapmaking
Date:	March 30th 2014
Version:	2.0
	Page 1

PACS Map-making Tools: Update on Analysis and Benchmarking

Coordinator and report compiler:
Roberta Paladini

Authors:
(Alphabetical order:) Babar Ali, Bruno Altieri, Zoltan Balog, Stefano Berta, Javier Gracia-Carpio, Vera Könyves, Gabor Marton

Summary

On November 1st 2013, the PACS map-making group released a report containing a preliminary assessment of the performance of six map-making codes: Jscanam, MADmap, SANEPIC, Scanamorphos, Unimap, Tamasis. Following the document release, the PACS ICC, with the endorsement of the Herschel Science Team (HST) and Herschel User Group (HUG), have decided to move forward with the implementation (through spawning) of Unimap in the SPG pipeline for a target HSCC 13 bulk reprocessing.

In the light of the MADmap development which has taken place since November, and given the delay of the Unimap implementation in SPG, the ICC has requested a re-assesment of the map-making codes status, by limiting the case to the softwares already present in the pipeline

Available in the PACS doc pages from HSC

PACS photometry, points to have in mind

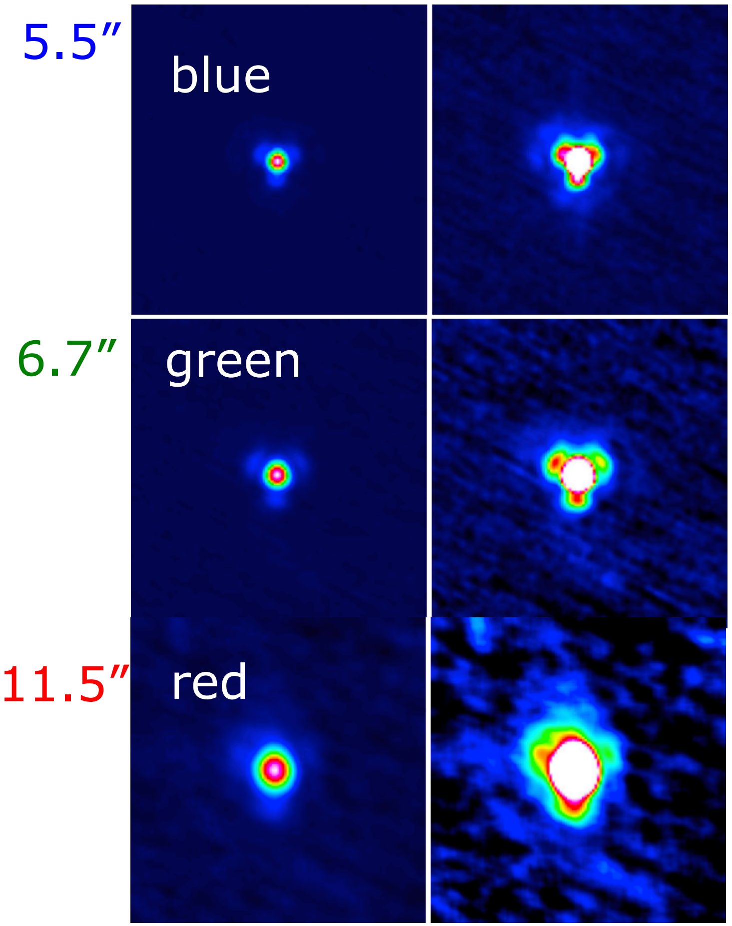
1. The flux calibration is ± 7% in the three bands.

2. The relative photometric accuracy is ±2%.

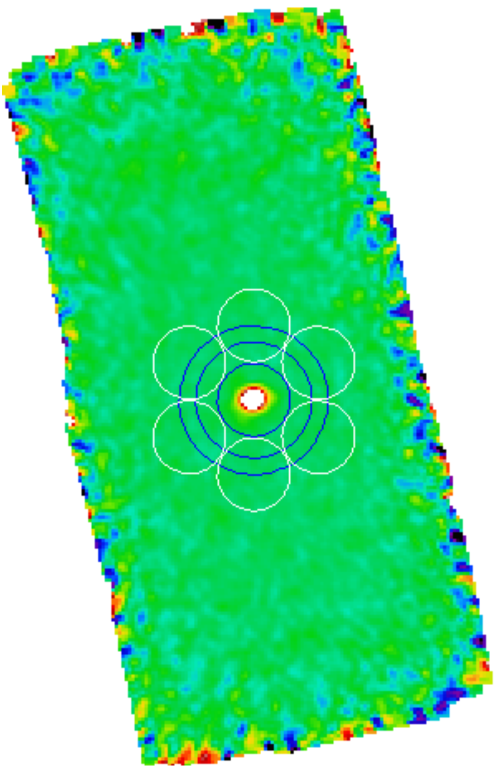
3. The absolute zero level of the maps is not known.

4. PACS PSF: no unique PSF, depends on
   - Scan angle
   - Scan speed
   - Data processing (HPF, projection…)
   - Diffraction limited with Gaussian core

   PSF fitting for photometry is quite challenging (see eg Magnelli+13)



PACS photometry

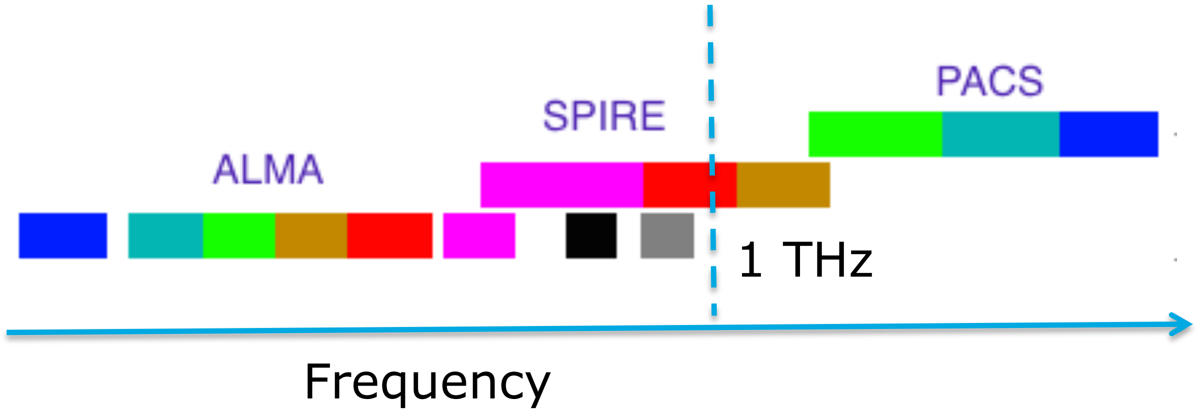


Aperture size?

- Annular sky aperture photometry for single objects:
- Integrated aperture flux error estimation is tricky
- Error maps:
  - No error maps for the GLS mappers
  - Some proxies for an error map: i.e. st.dev. map
  - ➔ Correlated noise
  - Structure noise maps: under study
- Aperture corrections are available
- Colour-corrections: PACS assumes *νSν = const*
  ➔ technical report PICC-CR-TN-044
  (see also Balog+13)
- Source detection:
  - SExtractor, DAOphot, starFinder…
  - getFilaments/getSources
- Published catalogues. How reliable are those?

Herschel and ALMA: SPIRE

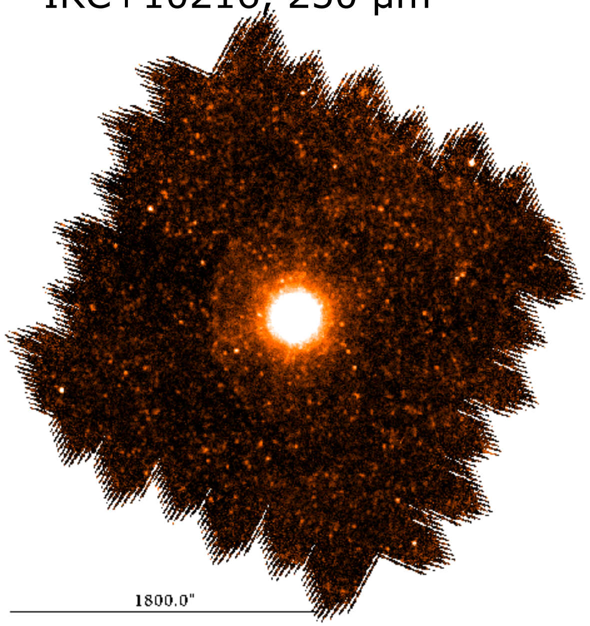
1. Two photometers with *Herschel*:
   a. PACS: 70 | 100, 160 µm
   b. SPIRE: 250, 350, 500 µm



Bands are real in LOG spacing

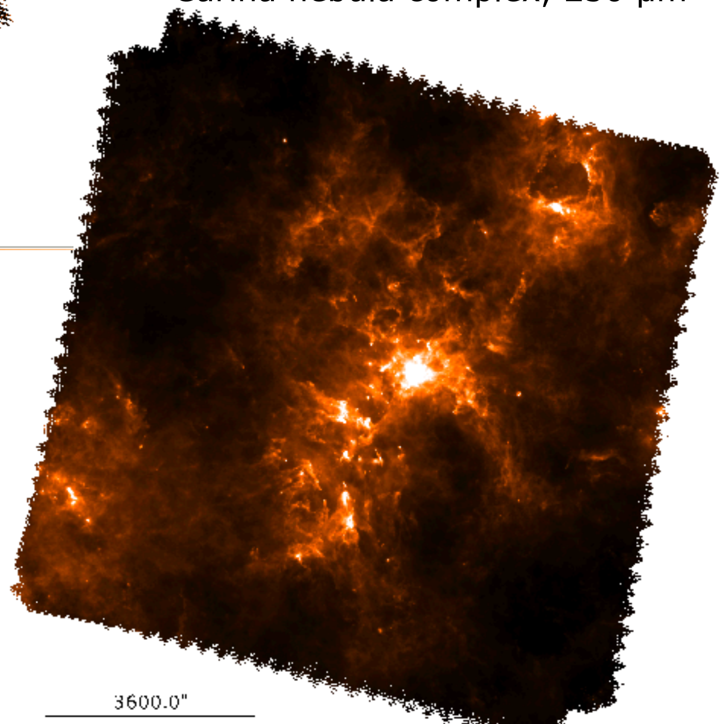
SPIRE maps

IRC+10216, 250 µm

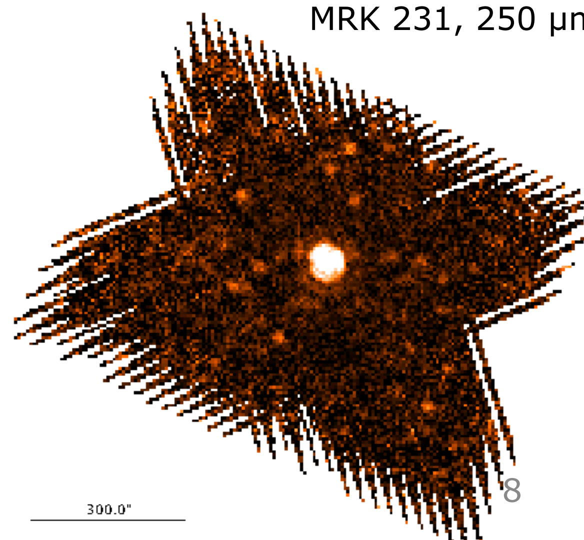


1. Destriper maps: iterative + naïve projection
2. Point-source calibrated in Jy/beam
3. Extended source calibrated, with Planck-derived zero offsets, in MJy/sr

Carina nebula complex, 250 µm

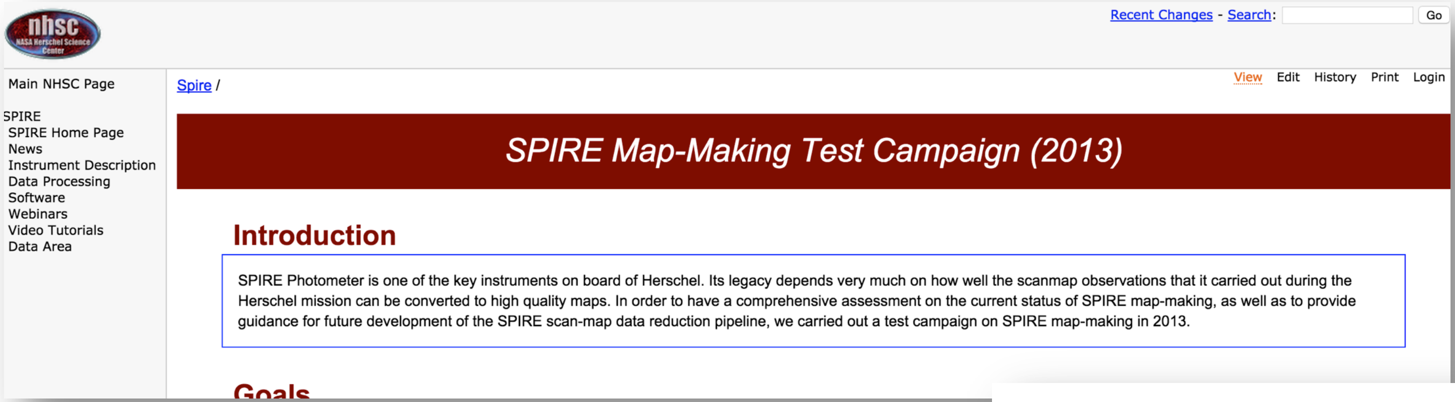


MRK 231, 250 µm



Nominal pixel size (6, 10, 14)″ at (250, 350, 500) µm

SPIRE maps, further information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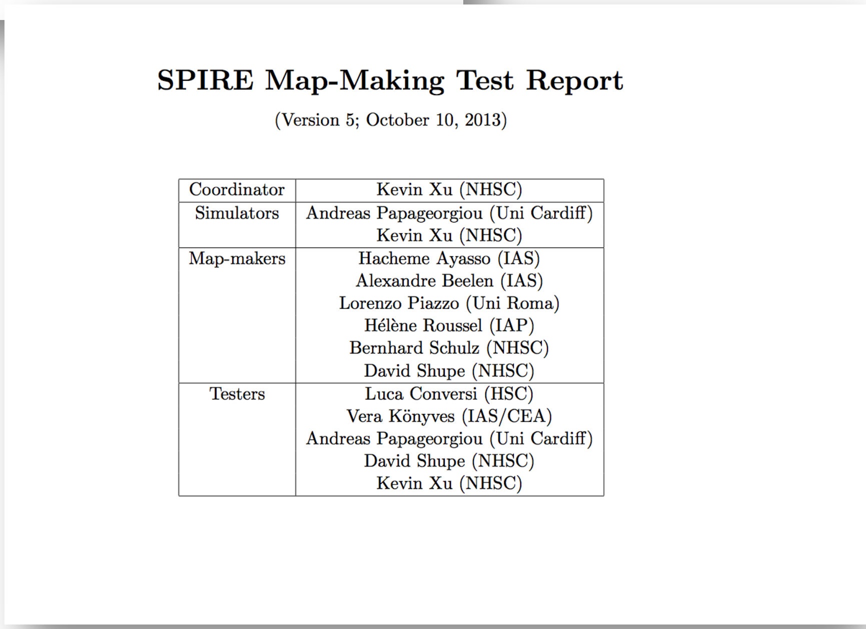
SPIRE Map-Making Test Campaign (2013)

Introduction

SPIRE Photometer is one of the key instruments on board of Herschel. Its legacy depends very much on how well the scanmap observations that it carried out during the Herschel mission can be converted to high quality maps. In order to have a comprehensive assessment on the current status of SPIRE map-making, as well as to provide guidance for future development of the SPIRE scan-map data reduction pipeline, we carried out a test campaign on SPIRE map-making in 2013.

Goals

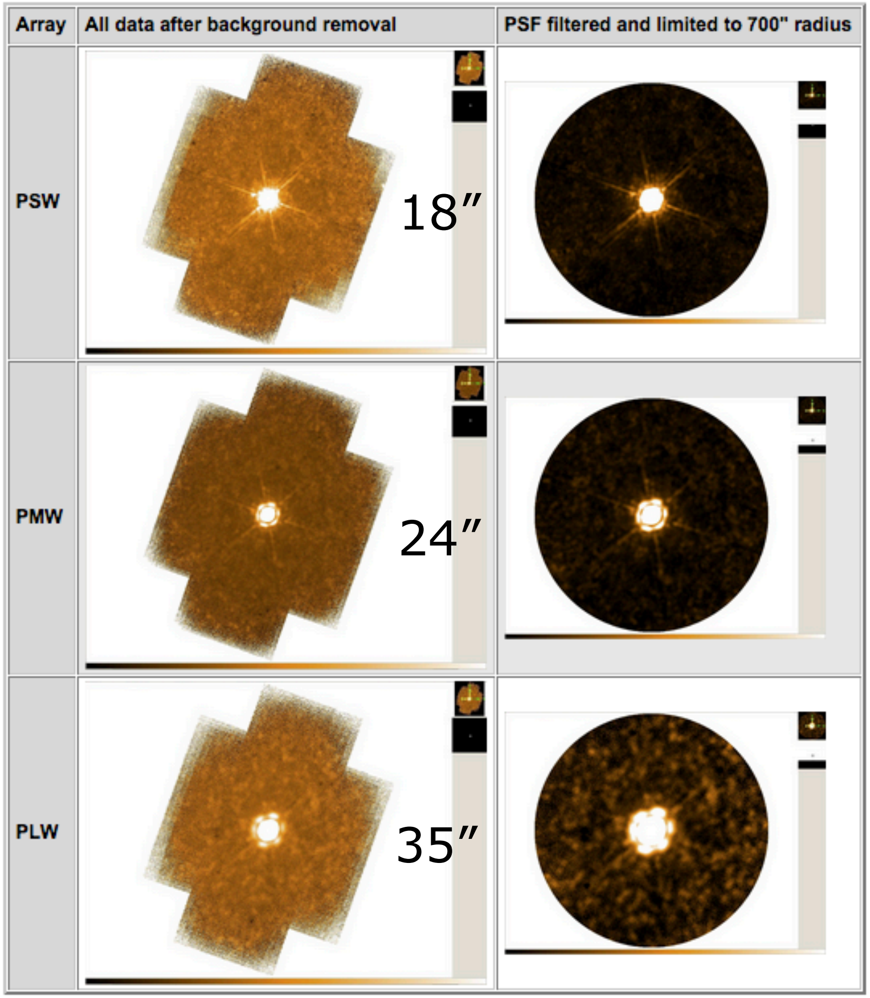

SPIRE Map-Making Test Report

(Version 5; October 10, 2013)

Coordinator	Kevin Xu (NHSC)
Simulators	Andreas Papageorgiou (Uni Cardiff) Kevin Xu (NHSC)
Map-makers	Hacheme Ayasso (IAS) Alexandre Beelen (IAS) Lorenzo Piazzo (Uni Roma) Hélène Roussel (IAP) Bernhard Schulz (NHSC) David Shupe (NHSC)
Testers	Luca Conversi (HSC) Vera Könyves (IAS/CEA) Andreas Papageorgiou (Uni Cardiff) David Shupe (NHSC) Kevin Xu (NHSC)

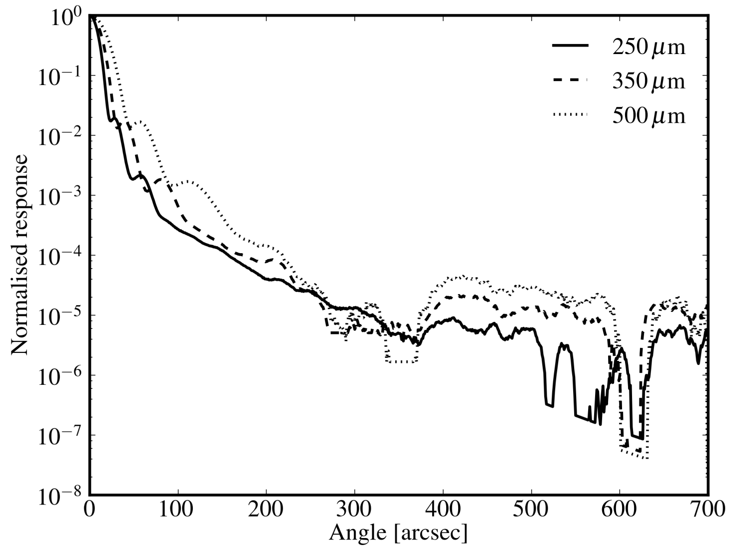
Report available: NHSC wiki pages or the PDF version from the SPIRE docs in the HSC web

SPIRE beams



Details + files available for download at the Herschel public wiki

Radial profiles



SPIRE photometry

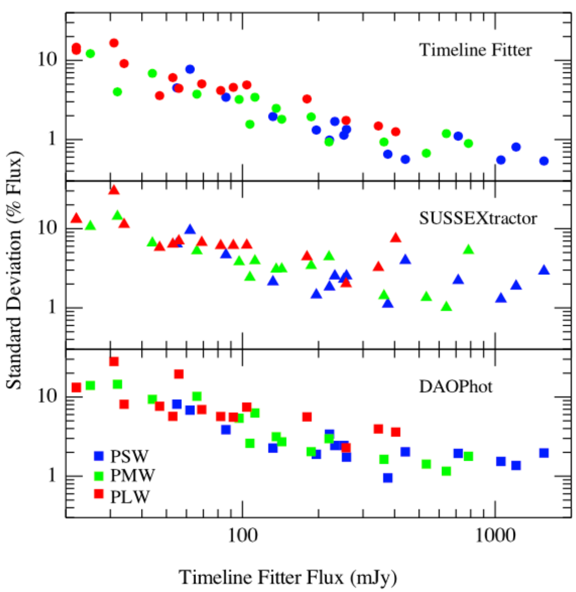
1. Point sources: use point source calibrated maps in Jy/beam
    a. Timeline fitter
    b. Source extraction with PSF fitting or other methods.
    c. Aperture photometry
    d. Quick and dirty method
2. Extended sources: use extended source calibrated maps + Planck zero offset in MJy/sr
3. Colour-corrections and beam corrections: read the SPIRE Handbook.

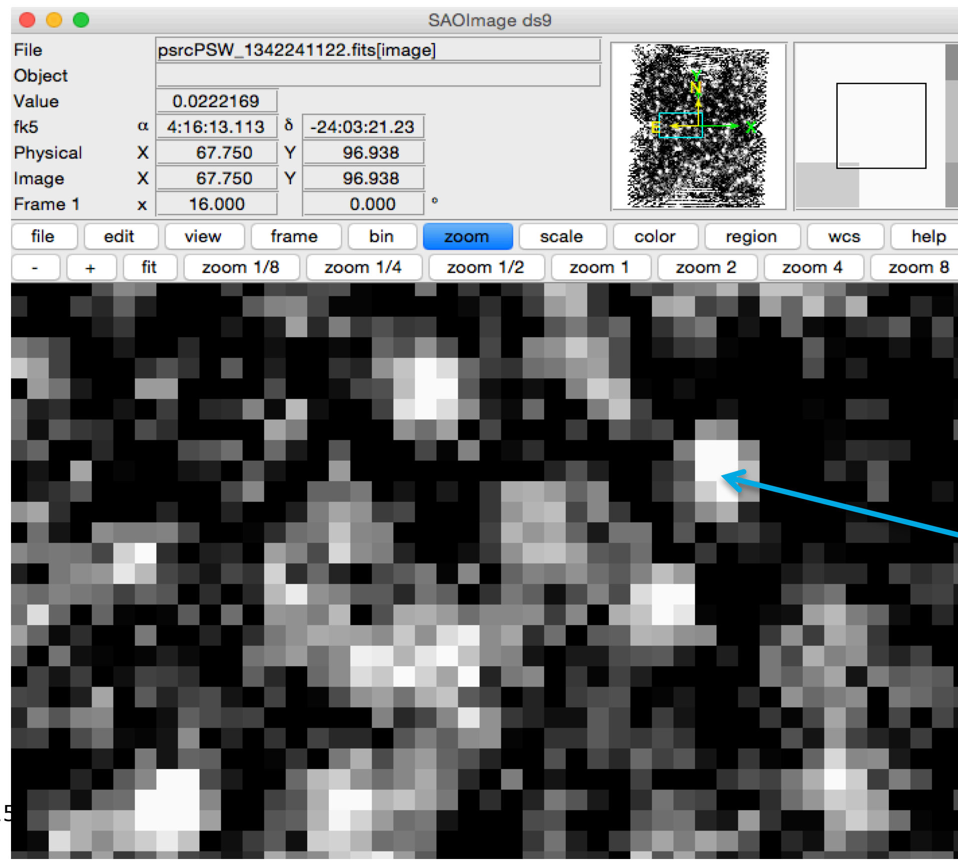
4. Use of community provided catalogues and maps. **Caution!**

Point source photometry

1. Useful **quick** and “dirty” photometry: Jy/beam maps ➔ pixel value is the peak flux density of a point source centred in that pixel.

Relative flux error

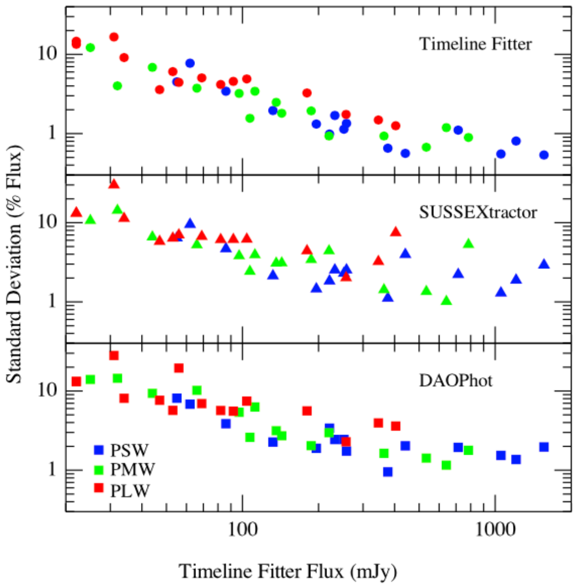




Lim+15, in prep

Point source photometry

Relative flux error



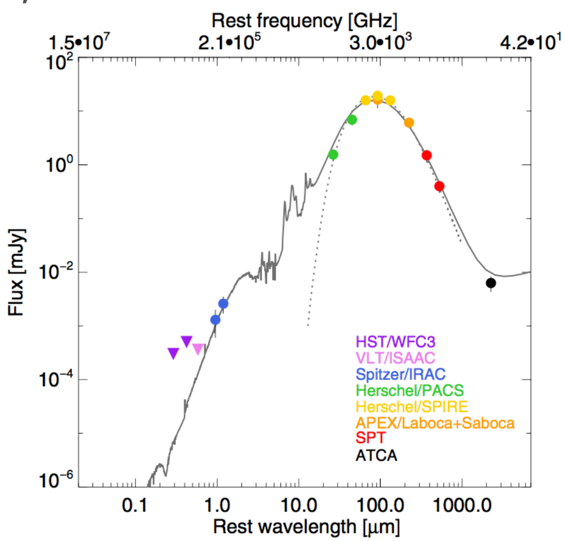
Lim+15, in prep

1. Useful **quick** and "dirty" photometry: Jy/beam maps ➔ pixel value is the peak flux density of a point source centred in that pixel.
2. **Timeline fitter** is the best method: need source positions and timelines after the destriper. It's easy to use in HIPE.
3. **PSF fitting** methods: use the empirical beams with suitable pixel size and position angle.
   Gaussian approximation is good in most cases.
4. **Aperture photometry** methods, careful with the aperture corrections: *Sv* dependent.
5. Colour-corrections: pipeline maps assume *vSv* = *const*. source.
   Tables and methods are available in the SPIRE Handbook.

SPIRE photometer: calibration accuracy

1. For point sources
   a. Absolute calibration accuracy ±4 %, correlated in the 3 bands, Neptune models
   b. Relative cal accuracy: ±1.5%, random, but flux dependent (see previous slide)
   c. **Overall: ±5.5%** (direct sum, conservative)
   d. Photometric uncertainty: method dependent, + confusion noise.

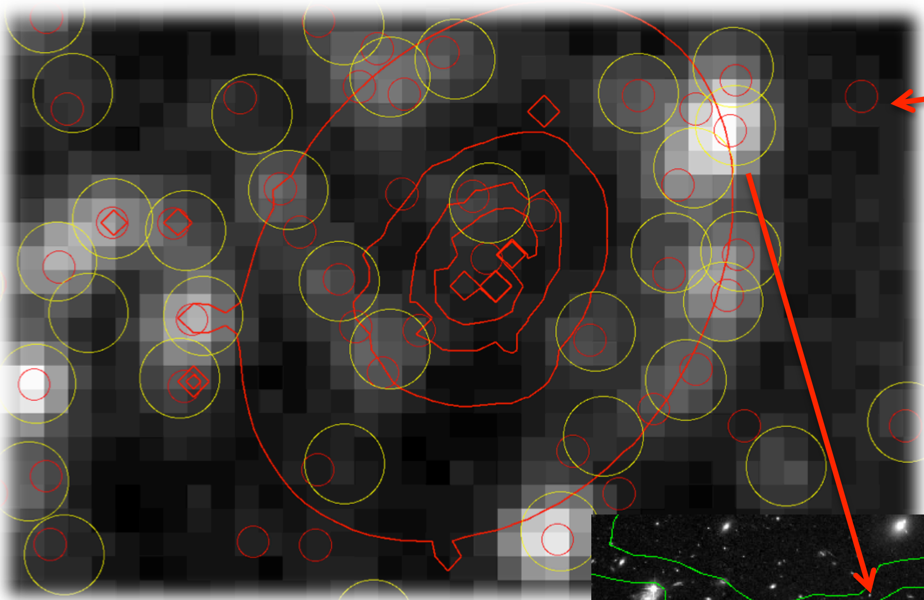
2. For extended sources:
   a. All of the above
   b. Uncertainty on the beam solid angle ±4%



Bothwell+13

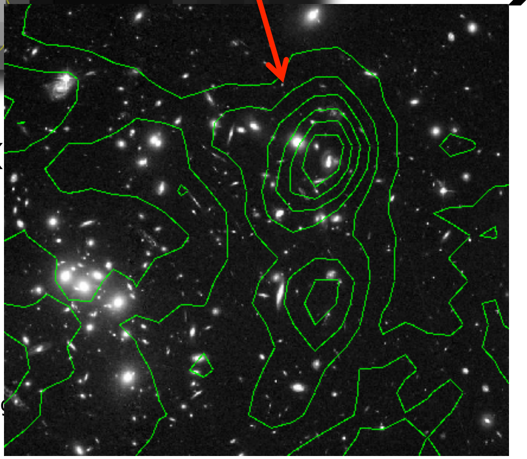
Point source photometry: blending

Source blending is a serious problem for SPIRE ➔ large beam



MIPS 24µm prior catalogue

CL0024, 250 µm, 6”/pix



Different possible ways to address blending:

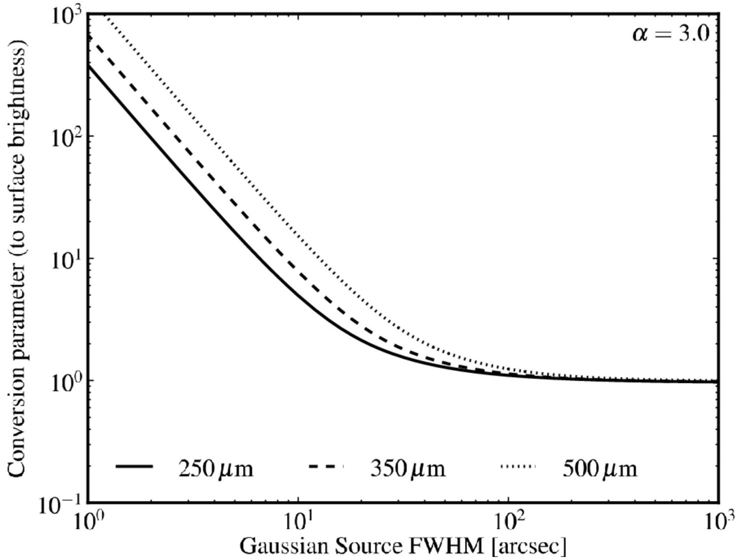
➔ Simultaneous prior position fit

➔ Monte Carlo methods (see Swinbank+15, MacKenzie+14)

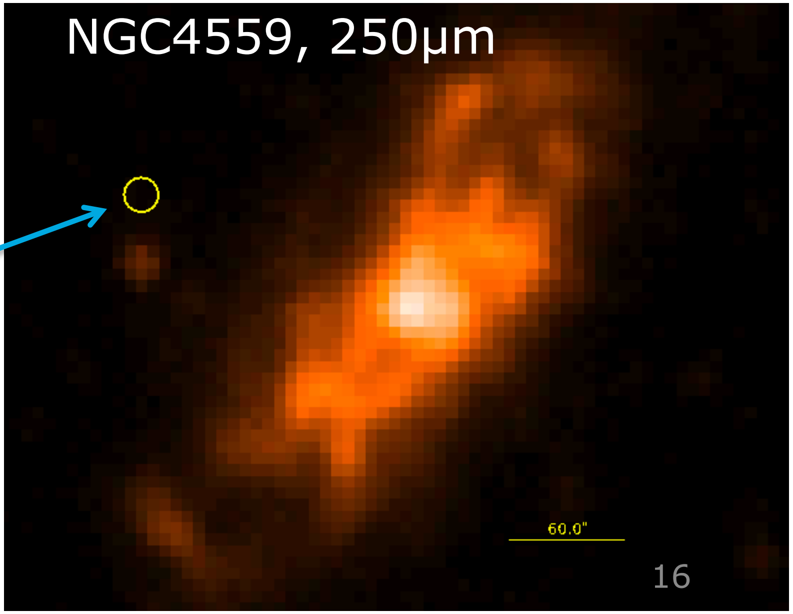
HST

Extended sources

1. Aperture photometry
   ➔ colour-corrections
2. Semi-extended sources:
   ➔ Methods are available to derive the source size correction (see Griffin+13) and the SPIRE Handbook.

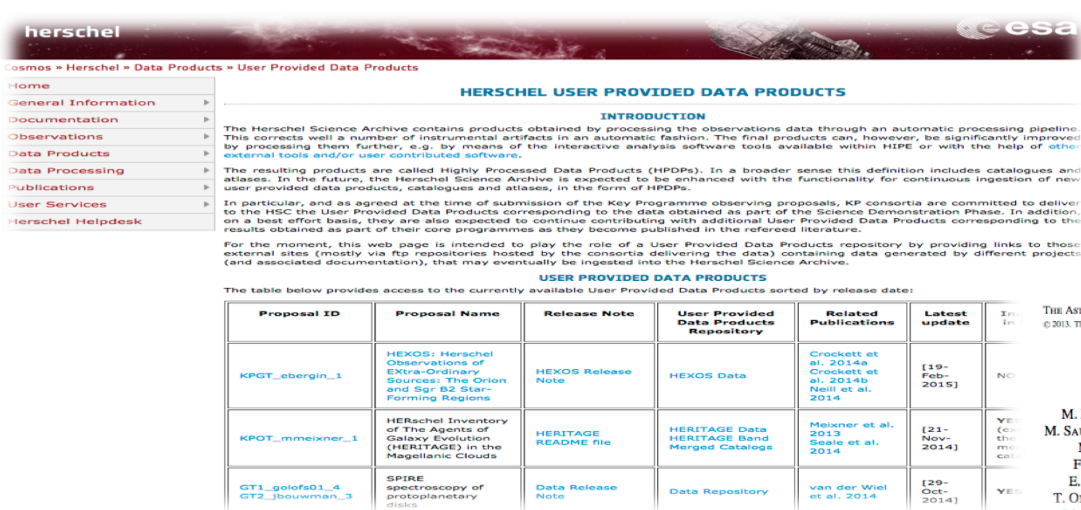


Beam FWHM



User provided catalogues and maps

1. Dedicated effort from strong KP teams
2. Carefully estimate the reliability, robustness, the limitations:
    a. Improvement in the calibration and pipelines since the publication.
    b. Good estimates of all the systematics (i.e. flux limits, signal-to-noise limits)



herschel

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HERSCHEL USER PROVIDED DATA PRODUCTS

INTRODUCTION

The Herschel Science Archive contains products obtained by processing the observations data through an automatic processing pipeline. This corrects well a number of instrumental artifacts in an automatic fashion. The final products can, however, be significantly improved by processing them further, e.g. by means of the interactive analysis software tools available within HIPE or with the help of other external tools and/or user contributed software.

The resulting products are called Highly Processed Data Products (HPDPs). In a broader sense this definition includes catalogues and atlases. In the future, the Herschel Science Archive is expected to be enhanced with the functionality for continuous ingestion of new user provided data products, catalogues and atlases, in the form of HPDPs.

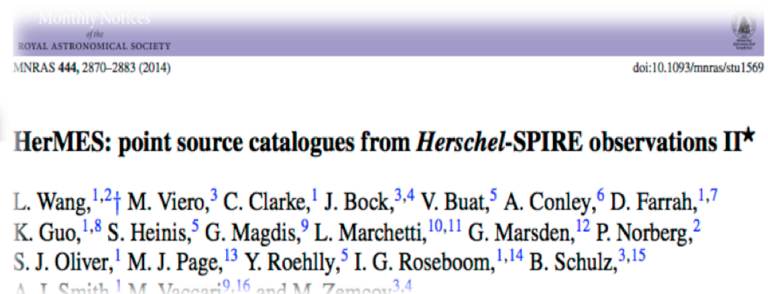
In particular, and as agreed at the time of submission of the Key Programme observing proposals, KP consortia are committed to deliver to the HSC the User Provided Data Products corresponding to the data obtained as part of the Science Demonstration Phase. In addition, on a best effort basis, they are also expected to continue contributing with additional User Provided Data Products corresponding to the results obtained as part of their core programmes as they become published in the refereed literature.

For the moment, this web page is intended to play the role of a User Provided Data Products repository by providing links to those external sites (mostly via ftp repositories hosted by the consortia delivering the data) containing data generated by different projects (and associated documentation), that may eventually be ingested into the Herschel Science Archive.

USER PROVIDED DATA PRODUCTS

The table below provides access to the currently available User Provided Data Products sorted by release date:

Proposal ID	Proposal Name	Release Note	User Provided Data Products Repository	Related Publications	Latest update	In...
KPGT_ebergin_1	HEXOS: Herschel Observations of EXtra-Ordinary Sources: The Orion and Sgr B2 Star-Forming Regions	HEXOS Release Note	HEXOS Data	Crockett et al. 2014a Crockett et al. 2014b Neill et al. 2014	[19-Feb-2015]	NO
KPOT_mmeixner_1	HERschel Inventory of The Agents of Galaxy Evolution (HERITAGE) in the Magellanic Clouds	HERITAGE README file	HERITAGE Data HERITAGE Band Merged Catalogs	Meixner et al. 2013 Seale et al. 2014	[21-Nov-2014]	YE...
GT1_golofs01_4 GT2_jbouwman_3	SPIRE spectroscopy of protoplanetary disks	Data Release Note	Data Repository	van der Wiel et al. 2014	[29-Oct-2014]	YE...

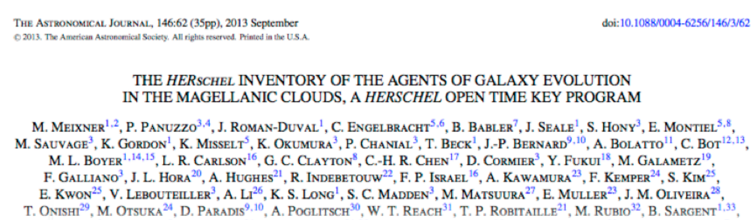


Monthly Notices of the ROYAL ASTRONOMICAL SOCIETY

MNRAS 444, 2870–2883 (2014) doi:10.1093/mnras/stu1569

HerMES: point source catalogues from *Herschel*-SPIRE observations II★

L. Wang,[1,2]† M. Viero,[3] C. Clarke,[1] J. Bock,[3,4] V. Buat,[5] A. Conley,[6] D. Farrah,[1,7] K. Guo,[1,8] S. Heinis,[5] G. Magdis,[9] L. Marchetti,[10,11] G. Marsden,[12] P. Norberg,[2] S. J. Oliver,[1] M. J. Page,[13] Y. Roehlly,[5] I. G. Roseboom,[1,14] B. Schulz,[3,15] A. J. Smith,[1] M. Vaccari[9,16] and M. Zemcov[3,4]



The Astronomical Journal, 146:62 (35pp), 2013 September doi:10.1088/0004-6256/146/3/62

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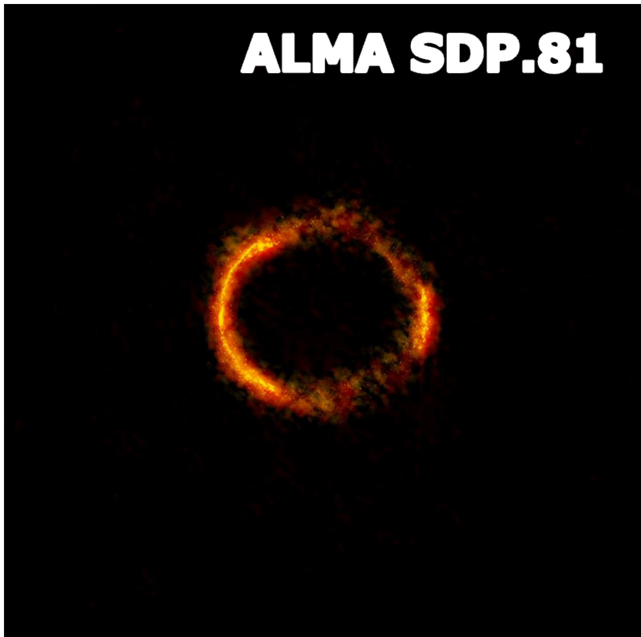
THE *HERSCHEL* INVENTORY OF THE AGENTS OF GALAXY EVOLUTION IN THE MAGELLANIC CLOUDS, A *HERSCHEL* OPEN TIME KEY PROGRAM

M. Meixner[1,2], P. Panuzzo[3,4], J. Roman-Duval[1], C. Engelbracht[5,6], B. Babler[7], J. Seale[1], S. Hony[3], E. Montiel[5,8], M. Sauvage[3], K. Gordon[1], K. Misselt[5], K. Okumura[3], P. Chanial[3], T. Beck[1], J.-P. Bernard[9,10], A. Bolatto[11], C. Bot[12,13], M. L. Boyer[1,14,15], L. R. Carlson[16], G. C. Clayton[8], C.-H. R. Chen[17], D. Cormier[3], Y. Fukui[18], M. Galametz[19], F. Galliano[3], J. L. Hora[20], A. Hughes[21], R. Indebetouw[22], F. P. Israel[16], A. Kawamura[23], F. Kemper[24], S. Kim[25], E. Kwon[25], V. Lebouteiller[3], A. Li[26], K. S. Long[1], S. C. Madden[3], M. Matsuura[27], E. Muller[23], J. M. Oliveira[28], T. Onishi[29], M. Otsuka[24], D. Paradis[9,10], A. Poglitsch[30], W. T. Reach[31], T. P. Robitaille[21], M. Rubio[32], B. Sargent[1,33],

The end



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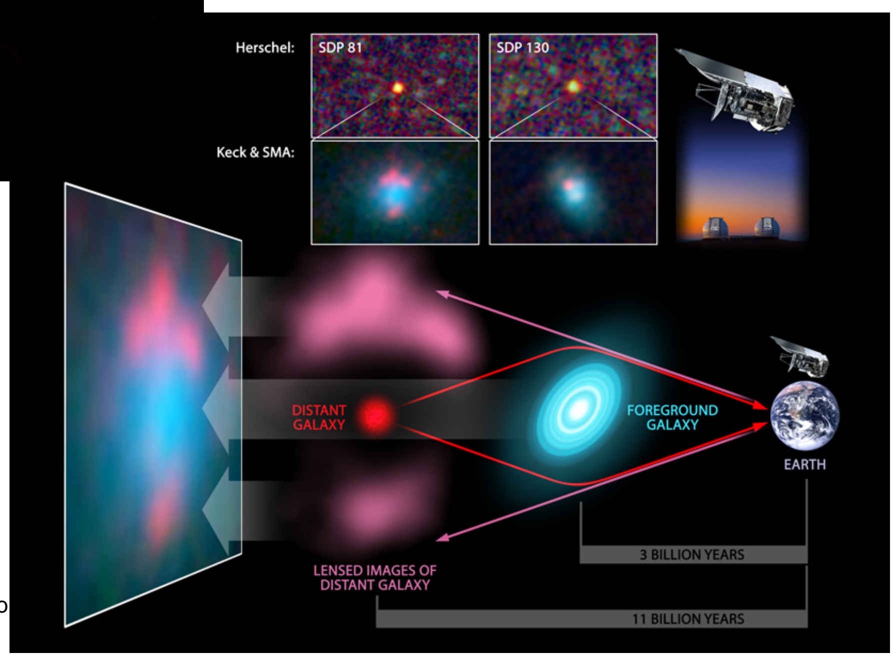
ESO ann15028
07 Apr 2015



Herschel PR
04 Nov 2010